

Claims 1-15 and 17-22 are pending.

The drawings stand objected to because the channels running concentrically as recited in Claim 1 are not shown.

Applicants enclose herewith for entry and approval a copy of Fig. 7, which illustrates the channels running concentrically. This figure illustrates only that which has already been described in the specification, and no new matter is introduced.

If the Examiner will indicate this approval of the proposed drawing, Applicants will arrange for submission of a formal drawing.

Claims 13-15 stand objected to under 37 CFR 1.75(c) as being in improper form because referring back to both Claims 1 and 12. This claim has now been amended to cancel the reference to Claim 1, and the objection should now be withdrawn.

Claims 22 and 17 stand rejected under 35 USC 112, first paragraph, because the Examiner views them as not enabled. More specifically, the Examiner does not see how a second module which engages into the space between the front and rear planes of another module is enabled.

The claims, however, recite that the engaging static mixer terminates flush with the plane of the front side or the plane of the rear side of the segments or regions

(Claim 17).

In Claim 22, the second mixer engages into those regions or segments of the disc shaped mixer module which have smaller spacing between the disc plane of the front side and the disc plane of the rear side than the remaining regions or segments. Thus, the "between" language refers to the structure of the module itself.

A fair reading of Claims 22 and 17 will show that they are fully enabled, and the rejections of said claims under 35 USC 112, first paragraph, should now be withdrawn.

Claims 1-12 and 17-22 stand rejected under 35 USC 112, second paragraph, as the Examiner views such claims as failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention, for various reasons more specifically indicated in the Office Action.

In Claim 1, the Examiner finds insufficient antecedent basis for the recitation of the flanks. Applicants have previously pointed out that the flanks are inherent in the recitation of the channels themselves. The Examiner disputes this, however, because he would not consider a cylindrical channel to have flanks.

The Examiner's attention is respectfully drawn to Fig. 1a, and the discussion of Fig. 1a at page 10 of the specification. From this, he will see that the flanks are clearly illustrated, and that there can be no misunderstanding of what and where they are.

In the case of a cylindrical shaped channel, the orifices would still be located in the flanks of the channels, and in Applicants' novel mixer modules, the flanks would still be an inherent part of the channels.

Regarding the disc planes of Claim 2, such are also inherent in the recitation of "disc". A disc has two sides, which can be referred to as a front side and a rear side. See page 1, lines 11-12. These sides are in planes. If the Examiner will take a look at e.g. Fig. 1b, Fig. 1c, or Fig. 2, he will see the disc plane illustrated at the top and bottom of each figure. Looking at Fig. 1c, the Examiner will see the dotted lines representing the disc plane, and he will see that the orifice 6 is at an angle to said disc plane, and he will also see angle α illustrated. Clearly, there is inherent antecedent support for the disc planes.

Regarding Claim 3, the expression is crystal clear, especially when read in the light of Fig. 1c. The flanks of the inlet channels will clearly be understood, and the flanks of the outlet channels will also be clearly understood. This is made even more clear when read in the light of the discussion of Fig. 1c, found at page 10, lines 13-16.

Regarding Claim 4, the mid axis is inherent in the recitation of an orifice, and same is illustrated in Fig. 2 by designating number 16. An orifice is an opening. An opening has a center. That center has an axis. Applicants do not understand the Examiner's questions regarding symmetry. How can an orifice not have a mid axis?

Claim 4 defines an orientation of the orifices relative to the plane of the flanks, and this definition will clearly be understood by any person skilled in the art, especially when read in the light of Fig. 2.

Similarly, the wall of the orifices clearly have antecedent support in the recitation of the orifice itself. If there was no wall, there would not be an orifice. An orifice is defined by its walls. An orifice is a void defined by the wall surrounding that void. Once again, the walls of the orifices can clearly be seen in Fig. 2..

The flank plane is inherent in the flank. Again, referring to Fig. 2, the flank plane can be seen as defined by the dotted line identified by designating numeral 17. The flanks are defined with respect to the channels. Which flank is meant would depend upon which channel was being referred to.

The expression "the channels" refers to whichever channel is being considered.

Referring to Claim 8, said claim depends from Claim 6. Claim 6, on the other hand, recites that the mixer module is divided into two or more regions or segments. When something is divided, the divisions are defined by boundaries. The boundaries of the regions or segments accordingly have inherent antecedent support in the recitation that the mixer module is divided into two or more regions or segments.

Regarding Claim 9, the planes of the front side and the planes of the rear side

are inherent in the recitation of the sides themselves.

Regarding Claim 10, the "disc plane" has inherent support in the recitation of the "disc", as discussed above.

Regarding Claim 17, this claim depends from Claim 22. Claim 22, on the other hand, recites a static mixer element which follows the mixer module and which "engages" certain elements of the module.

Thus, the "engaging static mixer" finds antecedent support in Claim 22.

The expression "the said plane" in Claim 17 is supported by the recitation of "the plane" in Claim 17, note that the expression regarding the maximum spacing refers to the planes of the front side or back side respectively. This will be understood to mean that the maximum spacing is with respect to the spacing to either the front side or the rear side, depending on which side the engaging mixer engages with. This will clearly be understood by those skilled in the art from the illustrations of Figures 4 and Figures 5, the discussion of the figures on page 11, and the discussion at page 7, lines 11-21.

The disc-shaped static mixer module recited in Claim 17 clearly refers to the disc shaped module to which another mixer is engaged.

In Claim 18, a plurality of mixer modules are arranged in a pipe. A mix flows

through that pipe. The "individual mixer module" is clearly a module of that plurality of modules.

Regarding "the front side", recited in Claim 18; same finds antecedent support in Claim 1, from which Claim 18 depends.

The "individual mixer module" recited in Claim 21 is, like the individual mixer module recited in Claim 18, one of the "at least two mixer modules".

Claim 21 depends from Claim 12. Claim 12 depends from Claim 1. Claim 1 provides antecedent support from the recitation of "the front side" in Claim 21.

"A conventional static mixer", as recited in Claim 22, will be well understood by those skilled in the art to refer to the different types of static mixers known to the art. Those skilled in the art will be able to select among them to determine which such person would combine with Applicants' mixer to best serve in the particular application contemplated.

Regarding Claim 22, "the planes of the front side" and "the planes of the rear side" find antecedent support in the same way as discussed above regarding Claim 9.

The expressions "the outer contours" and "the inner contours" have inherent antecedent support in the recitation of the conventional static mixer or disc shaped

static mixer module which engages with the at least one mixer module. Such mixers will be understood to be mixers having inner contours or outer contours which are adapted to and engage with the recited regions or segments of the at least one module.

The expression "the boundaries of the regions or segments" has inherent support in the recitation that the module is divided into two or more regions or segments. As so divided, the regions or segments inherently have boundaries, as discussed above.

The expression referred to by the Examiner in #30 on page 5 of the Office Action is an original recitation and does not require antecedent support - this expression defines the features of the regions or segments which the module is divided into.

Regarding the issue raised in #31, page 5 of the Office Action, the same issue has already been discussed above with respect to Claim 17. That discussion applies with equal force to the present issue.

Turning now to the art rejections, Claims 1, 2, 5, 11, 12, 18 and 21 stand rejected under 35 USC 102(b) as anticipated by King ('399).

The Examiner views Figure 3 of US '399 as showing the mixer described in Applicants' Claim 1. However the arrangement shown in Figure 3 is based on the mixing elements as shown in Figure 4 of the reference (see col. 3, page 32-37). Those

mixing elements of Figure 7 must be brazed together at their points of contact 35 in order to form a mixer array as represented by Figure 4.

In contrast to King's Mixer array Applicants' mixer modules are one part modules and are not constructed on the base of smaller mechanical pieces which must be welded or brazed together (see e.g. on page 8, lines 15ff of Applicants' description). Applicants' claims now recite that the modules are one part modules. The advantages of mixer modules are one part elements are:

A rigid structure; and

a higher pressure stability as compared with the welded array of US '399.

Another disadvantage of the US '399 mixer array is caused by the rear "ears" 33 (see Figure 4 and 5). If a viscous product stream goes through the mixing array of US '399 each rear ear 33 produces an undesirable stream channel of product without any mixing effect.

A further disadvantage of the welded structure according to US '399 is the weak heat transfer through the welding points 35 in the case that the pipeline is heated and the mixer is also used as a heat exchanging element, as Applicants have indicated for their mixer device on page 9, lines 24-26 of the description.

It is further emphasized that in order to go from the mixer array of US '399 to a mixer module according to the present invention, one would have to discard or cut off all rear ears 33 of the array (Figure 5) and replace the mult part arrangement having about 90 welding points by a one part structure. Following the disclosure of col. 5, lines 5-32, the presence of the rear ears 33 would be seen as necessary for the performance of the US '399 mixer array. The welding of the rear ears 33 is also a necessary condition for enabling the mechanical strength of the whole array (Figure 5).

Another essential feature of the US '399 mixer array is the "flat central portion" (see Claim 1 of US '399). This structural member is absolutely necessary for the mixing array of US '399. It is necessary because the mechanical strength of the whole structure is depending on the presence of the "flat portion".

Applicants' modules do not have those flat portions. These flat portions would unnecessarily enlarge the overall mixing distance of a mixer arrangement. As described on page 8, lines 4-9, it is one goal of Applicants' invention to keep the mixing distance as small as possible.

The King device is therefore different than Applicants', and cannot possibly anticipate Applicant's claims.

The rejection of Claims 1, 2, 5, 11, 12, 18 and 21 under 35 USC 102(b) as anticipated by King should accordingly now be withdrawn.

Claim 4 stands rejected under 35 USC 103(a) as obvious over King '399. The Examiner see King as differing from Applicants' Claim 4 only with respect to the angle between the orifice axis or wall and the flank, but sees it as obvious to "optimize" the angle of King.

First of all, the basic differences between King and Applicant's device have been discussed above, and nothing that the Examiner has pointed to would overcome any of these differences.

Secondly, there is nothing in King to suggest that there would be anything to be gained in changing this angle. Thus, nothing in King would suggest that the angle is an element that is subject to optimization.

There is no reason why King would make the changes necessary to arrive at the angle of Applicants' Claim 4.

For all of the foregoing reasons, Claim 4 cannot be seen as obvious over King, and the rejection of Claim 4 under 35 USC 103(a) as obvious over King should now be withdrawn.

Claims 3, 10, 17 and 20 stand rejected under 35 USC 103(a) as obvious over King '399 in view of Jeffers '191.

The differences between Applicants' device and that disclosed by King have already been discussed above. It has also been pointed out that it would not be obvious to change an angle "in the name of optimization" without some teaching or suggestion that such angle is an element which has an "optimum" value. Nothing in King or Jeffers teaches or suggests that the angle of the flank is an optimizable element. The Examiner's speculation is not a substitute for a concept not found in the art.

The Examiner relies on Jeffers for spacer contours.

Spacer contours, of course, will not compensate for the differences in the King reference, discussed above.

Despite the "prehistoric" dynamic mixer techniques which are disclosed in US '191 the function of the members G and H is different from the static mixers Applicants are dealing with. As can be found on page 1, in col. 2, line 67ff of US '191 the trough like receptacles G serve as a guard preventing heavy articles from falling down into the region of the agitators C and destroying them during their operation. The transverse bars H are constructive elements holding together the receptacles G and forming a passage way through the two rows of receptacles G. In US '191 the mixing of paints is performed by the dynamic mixer C and not by static mixing elements.

Jeffers therefore cannot be combined with US '399 because of the different

technical fields (dynamic mixer B,C) and because of the completely different purpose of the arrangement compared to the spacer contours of Applicants' mixer modules.

The rejection of Claims 3, 10, 17, 19 and 20 under 35 USC 103(a) as obvious over King in view of Jeffers should accordingly now be withdrawn.

Claims 6-9, 22 and 17 stand rejected under 35 USC 103(a) as obvious over King in view of Hirsch.

The Examiner cites Hirsch to show a disc divided into regions or segments.

The basic differences between Applicants' device and Kings' have now been discussed at length above. Nothing in Hirsch would overcome any of them

Moreover, the flow equalizer of Hirsch US '391 has nothing to do with Applicants' static mixers. US '391 only discloses that the velocity cross section of a liquid can be equalized by flat baffles 8, 8' having orifices of a greater diameter on an outer circle than on an inner circle of the baffles. US '391 does not teach or suggest anything about the function of Applicants' mixing arrangements. The separation of a mixer module into different regions with openings of different sizes in Applicants' invention leads to different **mixing properties** in those regions. US '391 does not deal with mixing of fluids. A combination with Hirsch and King is therefore not possible because the multipiece array of King cannot be constructed in the form of regions with different

apertures, especially if the regions have concentric boundaries.

The rejections of Claims 6-9, 22 and 17 under 35 USC 103(a) as obvious over King in view of Hirsch should accordingly now be withdrawn.

Applicants note the Examiner's comments that he sees Claims 17 and 22 as unclear.

Applicants' remarks regarding the individual '112 issues raised by the Examiner with respect to each of these claims show that the claims are not unclear at all.

In view of the above amendments and remarks, it is believed that Claims 1-12 and 17-22 are now in condition for allowance. Reconsideration of said claims by the Examiner is respectfully requested and the allowance thereof is courteously solicited. Should the Examiner not deem the present amendment and remarks to place the instant claims in condition for allowance, it is respectfully requested that this Amendment Under Rule 116 be entered for the purpose of placing the prosecution record in better condition for appeal.

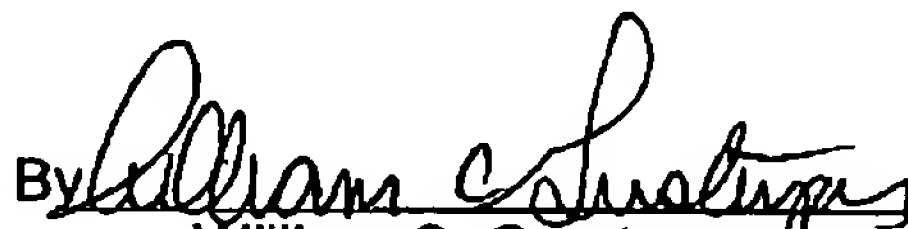
CONDITIONAL PETITION FOR EXTENSION OF TIME

If any extension of time for this response is required, applicants request that this be considered a petition therefor. Please charge the required petition fee to Deposit Account No. 14-1263.

ADDITIONAL FEE

Please charge any insufficiency of fees, or credit any excess, to Deposit Account
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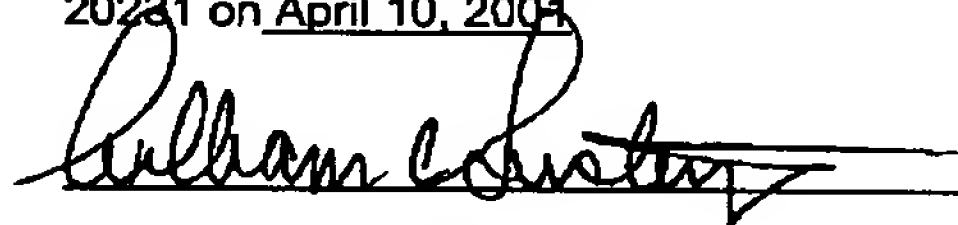
Respectfully submitted,
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20231 on April 10, 2001



Date April 10, 2001

**MARKED-UP COPY OF AMENDED CLAIM,
SHOWING CHANGES RELATIVE TO PREVIOUS VERSION**

Claim 1 (twice amended). Static mixer module [(10)], comprising a one piece disc which is provided with a multiplicity of orifices (6) and which is structured on its front side (2) facing the mix and on its rear side (3) by means of inlet channels (4) and mixing channels (5) running in parallel or concentrically, and in which the orifices (6) are made in the flanks (8) of the inlet channels (4) and open into the flanks (9) of the mixing channels (5).

Claim 13 (twice amended). Mixer arrangement according to Claim 12, wherein, in the mixer arrangement, at least two disc-shaped static mixer modules [according to claim 1] are arranged directly one behind the other.